



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :  G06F 15/00, G06G 7/52		A1	(11) International Publication Number: WO 95/24010  (43) International Publication Date: 8 September 1995 (08.09.95)
<p>(21) International Application Number: PCT/US95/02598</p> <p>(22) International Filing Date: 2 March 1995 (02.03.95)</p> <p>(30) Priority Data: 207,131 4 March 1994 (04.03.94) US</p> <p>(71) Applicant: MEDICAL DIMENSIONS, INC. [US/US]; Suite 205, 7400 East Caley Avenue, Englewood, CO 80111 (US).</p> <p>(72) Inventors: CHRISTOPHER, Kent, L.; 9086 East Colorado Circle, Denver, CO 80231 (US). BECKER, Barron, D.; 9367 Harvard Drive, Highlands Ranch, CO 80126 (US).</p> <p>(74) Agents: CARSON, W., Scott et al.; Dorr, Carson, Sloan &amp; Birney, P.C., 3010 E. 6th Avenue, Denver, CO 80206 (US).</p>		<p>(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).</p> <p><b>Published</b>  <i>With international search report.  Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	
<p>(54) Title: COMPUTER SYSTEM FOR MANAGING PATIENT CARE</p> <pre> graph LR     RP[Referred Patient] --&gt; PC[Phone Call]     SR[Self Referred] --&gt; PC     PC --&gt; R[Receptionist]     R --&gt; SA[Schedule Appt]     R --&gt; AC[Appt Card]     AC --&gt; FTP[First Time Patient]          PV[Patient Visit] --&gt; RI[Receptionist]     RI --&gt; PI[Patient Info (PI) Form]     PI --&gt; BS[Billing Service &amp; Hospital]          RI --&gt; HQ[History Questionnaire]     RI --&gt; AQ[Add'l Questionnaires]          HQ --&gt; IC[Initial Consultation]     IC --&gt; EX[Exam]     EX --&gt; A((A))          EX --&gt; HE[History Questionnaire]     EX --&gt; VS[Vital Signs &amp; Prep]     EX --&gt; PE[Physical Exam]          HE --&gt; AQ2[Add'l Questionnaires]     VS --&gt; AQ2   </pre>			
<p>(57) Abstract</p> <p>An integrated computer system manages medical care of patients by interactively prompting entry of information concerning a patient's medical history (13, 14), physical examination (17, Figs. 7-12), insurance coverage (12, Fig. 6), and diagnosis (30, Fig. 18). This is preferably accomplished by presenting the user with a series of menus or option lists (Fig. 4) that can be selected with a mouse. The system maintains a database (Figs. 20, 21) concerning the costs associated with medications, tests, and other medical treatments, together with any associated insurance requirements. The system allows the physician to review and compare cost information (Figs. 20, 21) for alternative treatments associated with the patient's diagnosis at the time that the physician prescribes a treatment for a patient.</p>			

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## COMPUTER SYSTEM FOR MANAGING PATIENT CARE

### BACKGROUND OF THE INVENTION

- 1. Field of the Invention.** The present invention relates generally to the field of computer systems for use in the medical field. More specifically, the present invention discloses a computerized system for managing patient care that includes the patient's registration information, medical history, physical examination results, tests, diagnosis, medications, and charges.
- 2. Statement of the Problem.** In general, doctors and other health care providers have not kept pace with the recent revolution in computer information management systems. Most hospitals and many individual physicians use computers to run financial and accounting software to generate bills, process insurance claims, and perform conventional accounts receivable, accounts payable, general ledger, and payroll functions. On the clinical side, the health care provider must typically deal with a fragmented crazy quilt of incompatible software packages that have been developed or acquired separately to address specific narrow aspects of the medical practice. For example, separate incompatible applications may be

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used by the radiology, laboratory, pharmacy, and nursing departments within a hospital. In the setting of a physician's practice, separate incompatible software packages are often used for scheduling, accounting, word processing, and retrieving results of 5 laboratory tests. A number of expert systems have been developed in the past to assist the physician in clinical diagnosis. Other software systems are intended to assist the physician in selecting appropriate tests and treatment, and interpreting test results. However, these expert systems have not been integrated with the other aspects of the 10 medical practice to enable the physician to monitor the outcome of patient treatment, in terms of either the cost or the efficacy of medical treatment.

A number of computer systems have been used in the medical field in the past, including the following:

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<u>Inventor</u>	<u>Patent No.</u>	<u>Issue Date</u>
Garcia	5,065,315	Nov. 12, 1991
Mohlenbrock et al.	5,018,067	May 21, 1991
20 Miwa	4,974,607	Dec. 4, 1990
Mohlenbrock et al.	4,667,292	May 19, 1987
Pritchard	4,491,725	Jan. 1, 1985
Lamb et al.	4,489,387	Dec. 18, 1984
Worthington et al.	3,566,370	Feb. 23, 1971

25

Southwick, "Selling the Client-Server Cure," Upside, pages 41 - 54 (January 1994).

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Garcia discloses a hospital computer system that includes a terminal in all hospital departments for entering information pertinent to a patient's stay in the hospital. The initial information entered as part of the admitting procedure includes the patient's history and the admitting physician's physical examination results. The system also

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includes the physician's orders for tests or hospital services to be performed. The system prints a history and physical report for the patient's chart and highlights any abnormal findings and complaints. The system additionally schedules all hospital services for the patient  
5 to eliminate scheduling conflicts. Test results, physician's notes and findings are automatically included in the patient's chart. The information entered into the system may be used to bill the patient for all services and tests performed.

Worthington et al. disclose an automated system for taking  
10 medical histories. A slide projector is used to present the patient with a number of questions at a console. The patient's responses are entered via a keyboard and stored by a data processing system.

Miwa discloses a system for centralized management of medical data in the form of bio-body information (e.g.,  
15 electrocardiogram, body temperature, blood pressure) that is transmitted by wireless communications. The receiving unit stores general standard ranges and personal permissible ranges for the bio-body information and flags any abnormal data received from the patient.

Lamb et al. disclose a system for gathering data concerning a specific patient and for directing teams of medical personnel to perform procedures on this patient in a coordinated manner. Based on information provided by medical personnel via a data entry panel in response to questions displayed on a screen and/or information  
20 directly transmitted to the computer system from sensors measuring the medical condition of the patient, the medical teams are advised simultaneously or alternatively to perform diagnostic and therapeutic procedures according to a predetermined plan.  
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The '292 patent to Mohlenbrock et al. discloses a computer system for identifying the most appropriate billing category (Diagnosis Related Group or DRG) as the basis for determining the amount that the health care provider is to be reimbursed under Medicare and similar programs for medical services provided to patients. The '067 patent to Mohlenbrock et al. discloses a computer system for statistical analysis of patient costs based on DRG's.

Pritchard discloses a computerized medical insurance verification and processing system. The system reads a medical information card to determine the patient's background medical and insurance information. The validity of the card is rapidly determined by accessing a central brokerage computer. Information concerning charge codes and reimbursement is also exchanged through the central computer.

The article from Upside magazine discusses the lack of clinical information systems for comprehensively managing patient care in the medical field and summarizes a number of attempts by third parties in this area.

**3. Solution to the Problem.** None of the prior art references uncovered in the search show a computer system for managing clinical patient care that includes the patient's registration information, medical history, physical examination results, tests, diagnosis, medications, charges, critical pathways, procedures, treatment, education, problem list, outcome, research, authorizations, alerts, and reminders. This information allows the health care provider to continually monitor the outcome of the patient's care, in terms of both the patient's medical condition and the costs involved in treatment.

### SUMMARY OF THE INVENTION

This invention provides an integrated computer system for managing medical care of patients. The user is interactively prompted to enter information concerning a patient's medical history, physical examination, insurance coverage, diagnosis, and current medications. This is preferably accomplished by presenting the user with a series of menus or option lists that can be selected with a mouse. The system maintains a database concerning the costs associated with medications, tests, and other medical treatments, together with any associated insurance requirements. The system allows the physician to review and compare cost information for alternative treatments associated with the patient's diagnosis at the time that the physician prescribes a treatment for a patient. Test results can also be entered and then reviewed by the physician. The system maintains a problem list for each patient, including the current diagnosis, drug allergies and intolerances, medical history, and progress notes for each patient that can be reviewed by the physician at any time. The system can also include optional modules for patient scheduling, billing, and generation of correspondence to referring physicians.

A primary object of the present invention is to provide a computer information management system that is focused on caring for individual patients during a typical visit to a health care provider. Another object of the present invention is to provide a computer system that enables the health care provider to continually

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monitor costs and the efficacy of treatment as a function of patient diagnosis.

Yet another object of the present invention is to provide a computer system that can comprehensively manage patient medical records and thereby result in more efficient use of the physician's time in treating patients.

These and other advantages, features, and objects of the present invention will be more readily understood in view of the following detailed description and the drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention can be more readily understood in conjunction with the accompanying drawings, in which:

FIGS. 1, 2, and 3 are block diagrams providing a general overview of the system over the course of a typical patient's  
5 treatment.

FIG. 4 is a diagram showing the main menu for the present system.

10 FIG. 5 is a diagram showing an example of the screens used to enter general patient information when the patient initially registers at the physician's office.

FIG. 6 is a diagram showing an example of the screens used to enter insurance information for the patient during the registration process.

15 FIG. 7 is a diagram showing an example of the screens used by the health care provider to enter information on the patient's vital signs during a physical examination.

20 FIG. 8 is a diagram showing an example of the screens used by the physician to enter information during a physical examination. In this example, the information relates to examination of the patient's ears.

FIGS. 9 through 12 are diagrams showing another example of the set of screens used by the physician to enter information during a physical examination. In this example, the information relates to examination of the patient's pulmonary function.

FIGS. 13 and 14 are diagrams showing examples of the screens used by the physician to order tests for the patient and to indicate a diagnosis.

5 FIG. 15 is a diagram showing an example of the screens used by the physician to view the results of tests. In this example, the results of a spirometry test are illustrated.

FIG. 16 is a diagram showing the screen used by the physician to order and track the results of external tests (i.e., tests performed outside of the physician's office).

10 FIG. 17 is a diagram showing another example of the screens used by the physician to review the results of tests. In this example, the results of a blood test (complete blood count with differential) are shown.

15 FIG. 18 is a diagram showing the screen used the physician to monitor diagnoses for the patient.

FIG. 19 is a diagram showing the "problem list" screen used by the physician to provide an overview of the patient's diagnoses, surgical history, and drug allergies and intolerances.

20 FIG. 20 is a diagram showing the screen used to display the medications currently prescribed for the patient. The lower portion of this screen allows the physician to define and save a number of "medication profiles" for commonly prescribed medications or combinations of medications.

25 FIG. 21 is diagram showing another version of the current medications screen. The lower portion of this screen allows the physician to compare the costs of equivalent medications or to compare of costs of medications from different suppliers or pharmacies.

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FIG. 22 is a diagram showing the "physician exit review" screen used to provide the physician with an overview of the office visits, medical procedures, and active diagnosis for each patient.

FIGS. 23(a) and 23(b) are block diagrams showing the various databases used in the present system. A data dictionary of the fields contained in each database is provided in Appendix A.

DETAILED DESCRIPTION OF THE INVENTION

Turning to FIG. 1, a simplified block diagram shows the manner in which the present system is used during the initial portion of a typical patient visit to a physician's office. The patient can be either referred by another physician or self-referred. The patient typically initiates contact with the physician's office by a telephone call that is answered by the physician's receptionist. The receptionist and the patient schedule an appointment. The patient's name, address, and telephone number and the scheduling information are entered by the receptionist into the appointment scheduling database in the computer system by means of an input screen that prompts the receptionist to type data into each required input field. The system automatically generates appointment reminder cards 16 that can be mailed to patients a few days prior to their appointments. Alternatively, the system can periodically generate a report listing patient names, telephone numbers, and appointment times that can be used by the physician's staff to call patients to remind them of appointments.

A patient visit typically begins with the patient checking in with the physician's receptionist. An example of the main menu screen for the system is shown in FIG. 4. The receptionist selects the "Registration" option by clicking on the appropriate button with a mouse or by pressing a predesignated short-cut key on the computer keyboard. This brings up a series of input screens that prompt the receptionist to enter basic information concerning the new patient.

The main menu shown in FIG. 4 also allows health care providers to access the remaining features of the system, as described below.

FIGS. 5 and 6 show two examples of these screens for collecting information on the patient's name, address, phone numbers, sex, marital status, and insurance information. The patient may be asked by the receptionist to fill out pre-printed patient information forms 12 corresponding to these input screens to simplify gathering the necessary information. The receptionist can then readily input the patient information from the pre-printed forms into the computer system. The patient information can be printed or transferred electronically to the physician's billing service or to the hospital records system, if necessary. The patient is also asked to fill out a questionnaire 13 concerning the patient's medical history and present symptoms during the initial visit. Additional questionnaires 14 may be required during return visits by the patient. Information from these questionnaires 13 and 14 is also entered into the computer system by the physician's staff by means of a number of input screens.

Alternatively, the patient can be placed in front of a touch-screen. After an automated demonstration has been given to document appropriate responses and maximize the patient's ability to use the touch-screen, the patient is presented with a series of questions concerning his medical history and current symptoms. Just as a physician would do, the system takes the questions down an algorithmic path based on the previous responses by the patient. The questions involve specific areas directly related to the physician's specialty (e.g., respiratory questions related to pulmonary medicine), as well as general questions regarding medical history, allergies and drug intolerances, and social and family history. Any rare response

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that cannot be answered by a touch to the screen is flagged by the computer so that it can be addressed by the receptionist or physician. The information entered by the patient is translated into medical terminology and stored and can later be presented in outline form for  
5 quick review by the physician. This process is anticipated to save significant amounts of time for the physician and staff in acquisition and documentation of the patient's history. The physician can review and revise the registration information and medical history data for each patient during or after the initial consultation with the patient.  
10 This can be accomplished, for example, by a second computer screen in the physician's office or in each examination room.

The physician generally then proceeds with a physical examination of the patient. FIG. 7 shows the screen used to input the patient's vital signs (e.g., pulse, blood pressure, temperature, weight,  
15 and height). The physician can also selectively choose other areas of physical examination, depending on the physician's specialty and the patient's symptoms, by clicking on one of the categories listed along the top portion of the screen. For example, FIG. 8 shows one of a series of screens used for findings after physical examination of the  
20 patient's head, eyes, ears, nose, and throat (HEENT). The particular screen depicted in FIG. 8 relates to examination of the ears.

The physician can quickly and easily enter findings by clicking on the appropriate options with a mouse. This can be done non-intrusively while the physical examination is actually being conducted.  
25 The screens and their options are arranged in a tree structure so that the physician can easily progressively focus the physical examination in a logical manner based on the patient's symptoms. The option list format used in the input screens helps the physician in considering all relevant options during a physical examination. For those portions of

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the physical examination where findings are entirely normal, the physician can use a single mouse click to check off all relevant details on the screen, thus streamlining documentation of pertinent examination findings. The system gives the physician the ability to  
5 make each portion of the examination as in depth or as superficial as necessary, as defined by the organ system and symptoms involved and the clinical situation. In unusual cases where the listed options are inadequate, the physician can select either the "Text" or "Dictation" options shown in the lower left corner of FIG. 8 to enter  
10 keyboard text or record dictation concerning the patient's findings. This data is also stored by the system as part of the patient's medical records. In addition, voice recognition software can be employed to converted spoken dictation into text to minimize storage requirements.

FIGS. 9, 10, and 11 show other examples of input screens for  
15 different subcategories of physical examination of the patient's pulmonary function selected by the submenu at the top portion of each screen. It should be noted that selecting one of the options on these screens can bring up another window that prompts the physician to enter more detailed information concerning the selected  
20 option. For example, if the physician clicks on the "Wheezes" option under "Adventitious Sounds," the window shown in FIG. 12 pops up to prompt the physician to specify where the wheeze is located. Alternatively, this pop-up window could contain a diagram or picture  
25 of the chest and would ask the physician to click the mouse at a point on the diagram corresponding to the location of the wheeze.

FIG. 1 indicates separate steps for entering data about the patient's vital signs 15 and the remainder of the physical examination 17. This reflects the fact that a nurse or other health care provider can be assigned responsibility for taking the patient's vital signs,

while the remainder of the physical examination must normally be conducted by a physician. However, it should be expressly understood that all of this information is actually stored in the same database within the computer system, as will be discussed below.

5       The physician may wish to order medical tests based on the findings of the physical examination and the doctor's tentative diagnosis as shown at step 22 in FIG. 2. Some tests can be performed in the physician's office, while other tests must be done in a hospital, laboratory, or other medical facility. The present system  
10      assists the physician in ordering tests based on a tentative diagnosis specified by the physician as shown in FIG. 13. For insurance reimbursement purposes, the physician is often required to specify the diagnosis or symptom that justifies a test. Failure to note the proper diagnosis or symptom (by a standard "ICD-9" code) for a test  
15      or procedure (identified by a "CPT" code designed by the American Medical Association) often results in denial of payment or delays payment by the insurance carrier. Furthermore, the patient's insurance carrier may require pre-authorization for certain tests, or require that specific tests be performed by a certain hospital or  
20      laboratory. The present system warns the physician of such insurance requirements at the time that tests are selected and ordered.

25      The system maintains a database of the costs associated with each type of test through various laboratories or testing locations. As shown in FIGS. 13 and 14, the physician is provided with the cost comparison information at the time tests are ordered. This allows the physician to immediately compare costs associated with alternative laboratories or testing locations.

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For tests performed within the physician's office (internal tests), the system automatically routes the test request to the appropriate staff member within the office, accepts input of test results 24, and allows the physician to review these test results either during the 5 same visit or at a later date. An example of the screen used to input the result of a spirometry test is provided in FIG. 15.

For other external tests, the system can be employed to generate the necessary forms and related paperwork to order the test. The results of external tests can also be input into the database of 10 patient information as shown in FIG. 17 (for a complete blood count with differential test). These results are then readily available for review and interpretation by the physician. The physician's evaluation of the test results can also be entered directly into the system. Finally, the system can include optional analysis modules to 15 process data from certain tests (e.g., spirometry flow data) and generate summary sheets and graphs 25 to simplify interpretation of the test data by the physician.

The present system can also be used to track the status of external tests that have been requested, but for which test results 20 have not been received. This helps ensure that test results are promptly reviewed by the physician and that follow-up measures can be taken on tests that have not been completed in a timely manner (e.g., due to scheduling difficulties, lost paperwork, or lack of cooperation by the patient). FIG. 16 shows the screen used to track 25 the status of external tests and their results.

The physician can select or revise the diagnosis for the patient at any time, as shown in the pop-up window in FIG. 13. Alternatively, "Diagnosis" is one of the buttons that can be selected on the main menu shown in FIG. 4. Diagnoses are presented in the form of a list

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of disorders associated their respective ICD-9 codes used for billing the patient and/or the patient's insurance carrier. FIG. 19 shows an example of a screen used to input and review the diagnosis for a patient in a pulmonary medicine practice. In this example, separate  
5 sublists are maintained for pulmonary and non-pulmonary diagnoses and for acute/chronic diagnoses. Once a diagnosis has been selected for a patient, this information is included in the "problem list" or status report for the patient (see FIG. 18). It can also be used for billing purposes, for financial analysis of the physician's practice, and  
10 for statistical studies tracking the medical outcome of patients and treatment costs associated with various diagnoses.

The physician may also wish to prescribe medications or other treatments for the patient. Here again, the physician can quickly prescribe medications by selecting the "Medications" button on the  
15 main menu shown in FIG. 4. This brings up an input screen similar to that shown in FIGS. 20 and 21. The physician has complete flexibility in entering information on drugs to be prescribed, including the drug name, strength, dosage, duration, etc. However, the physician may also save prescription information on commonly used medications in  
20 a number of "physician medication profiles." This enables the physician to quickly and easily generate prescriptions for sets of one or more medications that are commonly used in the physician's practice. The system can also present a list of suggested medications based on the diagnosis previously entered by the  
25 physician.

The system maintains a database of the cost for medications from various suppliers (e.g., local pharmacies, hospitals, and mail order companies). The physician can retrieve this cost information for any medication and view a cost comparison for available suppliers.

The system also provides the physician with a list of brand name and generic equivalents for medications to provide a wider range of alternatives for cost comparison. These features enable the physician to practice medicine in a cost-effective manner by providing  
5 immediate feedback of the cost associated with prescribing each medication. The system flags medications that should not be prescribed for the patient due to allergies and intolerances noted in the patient's medical history, as well as combinations of medications that might produce adverse side effects.

10 The physician may find it necessary to perform various medical procedures (e.g., surgery, physical therapy, or other treatments) on the patient. Here again, the physician selects the procedure from an option list, together with its associated CPT code for billing purposes. As shown in FIG. 2, the present system can automatically generate  
15 the required consent forms 28 prior to the procedure. The system will also store any procedure notes 29 and operative reports 20 produced during or after the procedure. The system will automatically generate pre-procedure or post-procedure instructions 21 for the patient. Finally, the system will generate appropriate billing information based  
20 on the selected CPT code for the procedure.

At the conclusion of the patient visit, the system generates a packet of printouts as shown in FIG. 3, including:

- 25
- a. Summaries of the patient registration information, medical history, physical examination, testing and procedure results, and a diagnosis report 30 to be included in the physician's file.
  - b. Paperwork for ordering tests 33
  - c. Medication flow sheet 34
  - d. Pharmacy prescriptions 35

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- e. Billing information 37
- f. Patient instruction and educational materials 38

5 Additionally, if a procedure has been scheduled for the patient, the system can generate:

- a. Hospital admittance forms 36
- b. Pre-procedure review sheets 31
- c. Patient information and handouts concerning the procedure 32

10

FIG. 22 shows the screen that the physician reviews immediately before the end of the patient's visit. This screen summarizes the office visit charges, procedures, and active diagnosis for the patient. The physician can quickly move back to the previous 15 screens relating to tests, medications, and the treatment plan for the patient by selecting one of the menu options at the top of the screen.

The patient typically checks out with the receptionist on the way out of the physician's office. The receptionist confirms hospital scheduling for the patient, if appropriate. The receptionist also 20 schedules the patient's next visit to the physician's office. This information is entered into the present system, which generates an appointment reminder card 40 for the patient, as shown in FIG. 3. Finally, the system generates correspondence 41 to referring physicians summarizing the patient's visit, diagnosis, and treatment. 25 Additional notes 39 concerning the patient can be entered into the system from other doctors, such as other specialists or the patient's primary care doctor.

FIG. 18 is an example of the "problem list" screen that the physician can access to quickly review a summary of any patient's

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medical status and history. The problem list includes the current diagnosis, drug allergies and intolerances, and medical history for the patient. The problem list identifies all past and present diagnoses for the patient and indicates whether each diagnosis is active or inactive.

- 5 As before, each diagnosis is given a standardized ICD-9 code. If additional information is needed, the physician can quickly move to any of the screens previously discussed to access more detailed information. The problem list is intended primarily to assist the physician in responding to patient telephone calls or to refresh the  
10 physician's memory prior to a return visit by the patient.

The standardized patient billing sheet for an office visit is called a "superbill." At the end of the office visit, the system brings forward the visit charge (also given a CPT code), as well as the codes and charges for all office procedures, medications, tests, and  
15 interpretation fees. For reimbursement purposes, these charges are tagged with their appropriate CPT codes. This helps the physician and office staff to minimize overlooked, incomplete, or improper charges. The standard superbill format facilitates transfer of this information to outside billing companies or insurance carriers.

- 20 The present system is typically implemented as a series of tables in a relational database (e.g., FoxPro marketed by Microsoft Corporation, Redmond, Washington) running on a series of microcomputers tied together with a local area network (LAN). Alternatively, in a larger medical practice, the system could be  
25 implemented by one or more minicomputers or mainframe computers running in a multi-user environment with a number of terminals distributed throughout the physician's office.

The present system provides the physician with immediate information on the costs associated the various medications, tests,

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and other treatments associated with patient care. The information stored by the system over time can also be used in statistical studies to track the quality of patient care and the costs associated. For example, the patient database accumulated by the present system  
5 can be used to analyze the effectiveness of alternative treatments or medications for a specific diagnosis, both in terms of the patient medical outcome and the cost of treatment. The system can also provide statistical information concerning the nature of the physician's practice, such as identifying the most common diagnoses,  
10 medications, procedures, and referral sources for the physician's practice.

This can be very useful information, even for a sole practitioner. However, it should be expressly understood that the present system is designed for use in virtually any clinical setting and  
15 is not limited solely to use in the physician's office. For example, many physicians are becoming affiliated with particular hospitals to form physician hospital organizations (PHO). The system can be readily employed in the context of a PHO to allow any authorized physician within the network to access and share information  
20 concerning any PHO patient. In addition, the PHO can employ the present system to ensure uniform standards of health care throughout the PHO by establishing clinical guidelines or critical pathways for patient care. This can be implemented, for example, by standardizing the screens used to input patient history, physical examination  
25 findings, and diagnosis. The PHO can also standardize the screens used by physicians to select medications, tests, and procedures to help ensure cost-effective health care. Finally, the statistical information generated by the present system can be used by the PHO to track the overall outcome of patient care in terms of the

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effectiveness of treatment, patient medical outcome, and cost. These statistical summaries can be generated by diagnosis, by physician, or by treatment.

FIGS. 23(a) and 23(b) show the overall relationship of the  
5 tables used to implement the present system. A corresponding data dictionary of the fields within each of these tables is provided in Appendix A. Key fields within each table are indicated by asterisks.

The above disclosure sets forth a number of embodiments of  
the present invention. Other arrangements or embodiments, not  
10 precisely set forth, could be practiced under the teachings of the present invention and as set forth in the following claims.

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## APPENDIX A

### REGISTRATION FILES

#### Schedule Information

- \*Patient ID
- Schedule Patient Type
- \*Schedule Date
- \*Schedule Time
- Schedule Visit Type
- \*Schedule Location ID
- \*Schedule Physician ID
- \*Schedule Non-Physician ID

#### Visit Information

- \*Visit Date
- \*Visit Time
- Visit Type
- \*Visit Location ID
- \*Patient ID
- \*Visit Physician ID
- \*Visit Non-Physician ID

### PATIENT RELATED FILES

#### Patient Information

- \*Patient ID
- Patient SSN
- Patient First Name
- Patient Middle Initial
- Patient Last Name
- Patient Nickname
- Patient Birth Date
- Patient Sex
- Patient Marital Status
- Patient Insured
- Patient Employed
- Employee Occupation
- Patient Student
- \*Patient Research ID
- \*Other Contact ID
- \*Insurance Company

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\*Employer Name  
\*School Name  
\*Physician ID (Subfile)

Primary, Referring , Consulting, Staff, etc.

**Other Contact Information**

\*Patient ID  
\*Other Contact Type  
Other SSN  
Other Contact First Name  
Other Contact Middle Initial  
Other Contact Last Name  
Other Relationship  
Other Occupation  
Other Comments  
Other Contact ID  
Other Guarantor

**Employer Information**

\*Employer Name  
Patient ID

**Insurance Information**

\*Insurance Type  
\*Insurance Company  
Insurance Covered  
Insurance Policy Number  
Insurance Group Number  
Patient ID  
Payment Terms  
Payment ID

**Student Information**

\*School Name  
Patient ID

**Other Information**

\*Patient ID  
Other Patient Living Will  
Other Patient Living Will Year  
Other Cardio Resuscitation Pos  
Other Cardio Resuscitation Year  
Other Intubation or Mech Vent Pos

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Other Intubation or Mech Vent Year  
Other Pneumovac  
Other Last Year Flu Shot

## HISTORY FILES

### Patient Questionnaires

\*Patient ID  
\*Questionnaire Visit Date  
Questionnaire Original Complete Date  
Questionnaire Last Modify Date  
Questionnaire Last Modify User

### Patient Questionnaires Chart

\*Patient ID  
\*Question ID  
A Number Response  
B Number Response  
C Number Response  
Number Qualifier

## PHYSICAL EXAMINATION FILES

### Examination Information

\*Patient ID  
\*Exam Visit Date  
Heart Rate (Pulse)  
Blood Pressure-High (BP)  
Blood Pressure-Low (BP)  
Millimeters of Mercury  
Respiratory Rate (RR)  
Temperature  
Height (cm)  
Weight (Kg)

## TEST FILES

### Patient Test Order

\*Patient ID  
\*Visit Date  
Test Location  
Cost

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Preadmission  
\*Test ID  
Physician Order Request  
Schedule Date  
Actual Test Date  
Office Receive Date  
Office Test Requirement  
Test Result Status  
Interpretation Requirement  
Interpretation Status  
Send Out Requirement  
Send Out Status

**Patient Test Results**

\*Patient ID  
\*Results Visit Date  
\*Results Test ID  
Results Device Type  
Results Flow Rate

**MEDICATION FILES**

**Patient Medications**

\*Patient ID  
\*Drug ID  
Medication Status  
Cost  
Location  
Intolerances

**Patient Medication Flow**

\*Patient ID  
\*Drug ID  
\*Visit Date  
Action  
Strength  
Dose  
Interval  
PRN  
Duration  
Sequence  
Dispense  
Number of Refills

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Start Date  
Expiration Date  
Taper  
Comments

**Physician Medication Profile**

\*Physician ID  
\*Drug ID  
Strength  
Dose  
Interval  
PRN  
Duration  
Dispense  
Route  
Category  
Contains  
Taper  
Comments

**Medication Master Control File**

\*Physician Id  
\*Drug ID  
Strength  
Dose  
Interval  
PRN  
Duration  
Dispense  
Route

**DIAGNOSIS FILES**

**Patient Diagnosis**

\*Patient ID  
\*Diagnosis ID  
Date Active  
Date Inactive

**Patient Allergies**

\*Patient ID  
\*Allergic Secondary ID

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Drug Description  
Reaction

**Patient Surgeries**

\*Patient ID  
\*Surgery Secondary ID  
Surgery Description  
Surgery Date

**VISIT CHARGE FILES**

**Visit Charges**

\*Patient ID  
\*Charge Visit Date  
\*Charge ID  
Charge Level  
Charge CPT Code  
Charge Diagnosis ID  
Charge Co-Pay Amount Billed  
Charge Patient Bill Date  
Charge Co-Pay Amount Paid

**OTHER FILES**

**Progress Notes**

\*Patient ID  
\*Date

**RESEARCH FILES**

**Research Participant Information**

\*Research ID  
\*Patient ID (Subfile)  
Research Start Date  
Research Stop Date

**FILE MAINTENANCE**

**Business Control File**

\*Business Name  
Business Address 1

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Business Address 2  
Business City  
Business State  
Business Zip  
Business Area Code  
Business Phone

**Security Control File**

\*Security ID  
Security Password

**Physician Information**

\*Physician ID  
Physician First Name  
Physician Middle Initial  
Physician Last Name  
\*Physician Specialty

**Research Control File**

\*Research Type  
Research Description  
Research ID

**Medication Cost Control File**

\*Drug ID  
\*Location ID  
Cost

**Medication Cost Location Control File**

\*Location ID  
Location Description

**Visit Charges**

\*Charge ID  
Charge Description  
Charge Category  
Description  
Level  
CPT Code Required  
Diagnosis ID Required  
Visit Fee

**WE CLAIM:**

1. A computer system for managing medical care of patients comprising:

means for interactively prompting entry of information concerning the medical history and physical examination of a patient  
5 ("patient information"), and for storing said patient information;

means for interactively prompting entry of information concerning diagnosis of said patient and for storing said diagnosis information;

10 database means for storing and retrieving information concerning the costs ("cost information") associated with various medications, tests, and other medical treatments ("treatments"); and

15 means for displaying cost information retrieved from said database for alternative treatments associated with said diagnosis for said patient, and for interactively prompting a physician to enter information concerning treatments prescribed for said patient based on said diagnosis.

2. The system of claim 1, further comprising means for entering and storing results of tests ordered for said patient, and means for enabling a physician to review said test results.

3. The system of claim 1, further comprising means for scheduling patient visits to said physician's office.

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4. The system of claim 1, further comprising means for generating correspondence to referring physicians regarding diagnosis and treatment of patients.

5. The system of claim 1, further comprising means for generating bills for medical services provided to patients based on said diagnosis information.

6. The system of claim 1 wherein said means for interactively prompting entry of patient information presents subsequent prompts based on symptoms indicated by previously entered patient information.

7. The system of claim 1, further comprising means for allowing said physician to interactively review and revise said patient information, said diagnosis information, and said treatment information for said patient.

8. The system of claim 1, further comprising means for providing said physician with a problem list for any patient, including the current diagnosis, drug allergies and intolerances, and medical history for said patient.

9. The system of claim 1, wherein said patient information further comprises information concerning said patient's insurance coverage, and wherein said database further provides said physician with information concerning requirements for treatments imposed by  
5 said patient's insurance carrier.

10. A computer system for managing medical care of patients comprising:

5 patient registration means for interactively prompting entry of information concerning a patient's medical history and insurance coverage ("patient information") and for storing said patient information;

10 means for interactively prompting a health care provider to enter information concerning the results of physical examination of said patient in response to a series of sets of options displayed for said health care provider;

means for enabling a physician to review said patient information and said physical examination information for said patient;

15 means for interactively prompting a physician to enter information concerning diagnosis of said patient, including selection of appropriate billing codes for said diagnosis;

20 database means for storing and retrieving information concerning the costs ("cost information") associated with various medications, tests, and other medical treatments ("treatments") and requirements concerning treatments imposed by various insurance carriers ("insurance requirements"); and

25 means for displaying cost information and insurance requirements retrieved from said database for alternative treatments associated with said diagnosis for said patient, and for interactively prompting a physician to enter information concerning treatments prescribed for said patient based on said diagnosis.

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11. The system of claim 10, further comprising means for entering and storing results of tests ordered for said patient, and means for enabling a physician to review said test results.

12. The system of claim 10, further comprising means for generating bills for medical services provided to patients based on said billing codes.

13. The system of claim 10 wherein said means for interactively prompting entry of patient information presents subsequent prompts based on symptoms indicated by previously entered patient information.

14. The system of claim 10, further comprising means for providing said physician with a problem list for any patient, including the current diagnosis, drug allergies and intolerances, and medical history for said patient.

15. A computer system for managing medical care of patients comprising:

patient database means for maintaining a database of patient information, including:

- 5           (a) patient registration means for interactively prompting entry of information concerning a patient's medical history and insurance coverage during an initial visit and for storing said patient information;
- 10          (b) means for interactively prompting a health care provider to enter information concerning the results of physical examination of said patient in response to a series of

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- sets of options displayed for said health care provider during said initial visit;
- 15           (c) means for interactively prompting a physician to enter information concerning diagnosis of said patient, including selection of appropriate billing codes for said diagnosis;
- (d) means for entering results of tests conducted for said patient; and
- 20           (e) means for enabling a physician to review and update information stored in said patient database;
- cost database means for maintaining a database of information concerning the costs ("cost information") associated with various medications, tests, and other medical treatments ("treatments") and requirements concerning treatments imposed by various insurance carriers ("insurance requirements"); and
- 25           means for displaying cost information and insurance requirements retrieved from said cost database for alternative treatments associated with said diagnosis for said patient, and for interactively prompting a physician to enter information into said patient database concerning treatments prescribed for said patient based on said diagnosis.

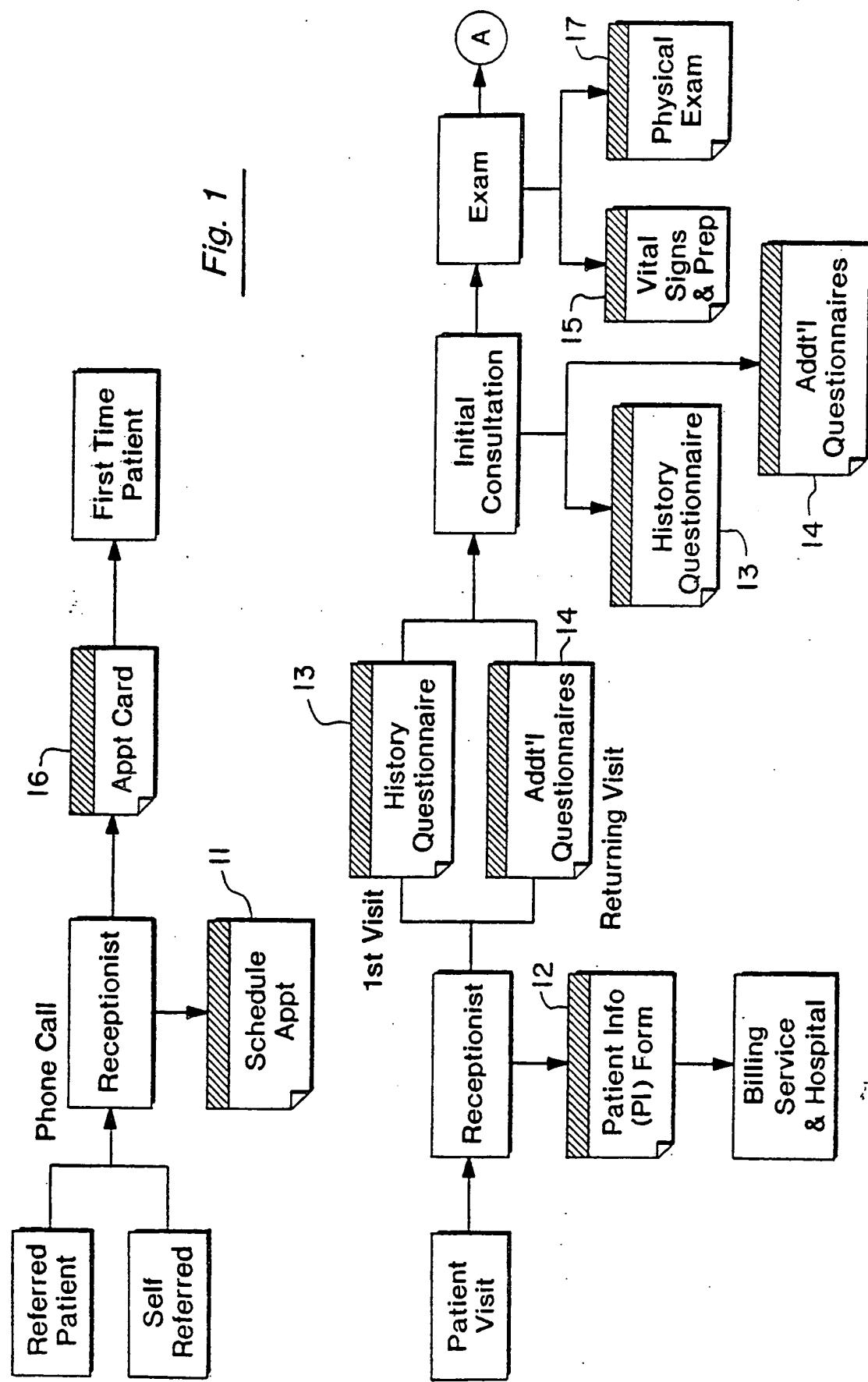
16. The system of claim 15, further comprising means for generating bills for medical services provided to patients based on said billing codes.

17. The system of claim 15 wherein said means for interactively prompting entry of patient information presents

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subsequent prompts based on symptoms indicated by previously entered patient information.

18. The system of claim 15, wherein said patient database means further comprises means for providing said physician with a problem list for any patient, including the current diagnosis, drug allergies and intolerances, and medical history for said patient.



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